

MR090L EVA In-Suit Light Exercise Prebreathe Protocol for ISS Crewmembers

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR090L In-Suit Light Exercise Prebreathe Protocol for ISS Crewmembers
Sponsor:	Medical Operations
Discipline:	EVA
Category:	Medical Requirements (MR)
References:	ISS Medical Operations Requirements Document (ISS MORD) SSP 50260 and Aeromed Flight Rule (FR) B13-253, EVA Medical Assessment and Biomed Constraints.
Purpose/Objectives:	To mitigate the risk of Decompression Sickness (DCS) in crewmembers participating in Extravehicular Activities (EVA).
Measurement Parameters:	Oxygen consumption, Rating of Perceived Exertion (RPE)
Deliverables:	Graphs of In-Suit Light Exercise (ISLE) training/verification data.
Flight Duration:	~ 6 months
Number of Flights:	Available for all flights
Number and Type of Crew Members Required:	All ISS crewmembers
Notes:	Additional References: EVA Prebreathe Reduction Protocol Flight Rule B13-260, In-Suit Light Exercise Prebreathe Protocol.

MR090L EVA In-Suit Light Exercise Prebreathe Protocol for ISS Crewmembers

3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity	Description:	Training will consist of procedure review with rationale, including medical constraints suiting up and performing in-suit light exercise while metabolic rate is being measured and EVA Physiology Lab (EPL) personnel provide feedback. Minimum acceptable ground training is the suited, light exercise metabolic training. The resulting data is required for EVA planning purposes. Training for the ISLE Prebreathe Protocol will be conducted by the EVA trainers and EPL personnel.			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		8 hours (EPL personnel conducts a 15 minute overview, and 30 minutes of suited, light exercise with feedback and metabolic data collection)	ISS EVA Prep and Post 31105	Can occur at either Prep and Post or at an Neutral Buoyancy Lab (NBL) run	Mission Operations Directorate (MOD) EVA trainers/ EPL personnel
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:		Test Location:	
	Laptop Computer, National Instruments Universal Serial Bus (USB)-6212, Kurz Mass Flow Meter and Computer, AEI Technologies CO ₂ Analyzer , Rating of Perceived Exertion (RPE) Chart	LabView software		JSC Building 9	
Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	JSC/Building 9 Airlock Mockup or JSC/NBL Topside A or B	4-110 Volt outlets	20-25 degrees C	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Other:		
	N/A	Controlled access			
Constraints/Special Requirements:	N/A				
Launch Delay Requirements:	N/A				
Notes:	<ul style="list-style-type: none">The EVA Prep and Post lessons are taught by MOD personnel and are 8.0 hours, take place in building 9, and EPL personnel will conduct the ISLE medical overview, light exercise description and exercise verification portion of the lesson, which is approximately 45 minutes.Building 9 Airlock Mockup is the prime location for training. If scheduling conflicts or equipment issues prevent training in Building 9, the NBL can be used as a backup location.				

MR090L EVA In-Suit Light Exercise Prebreathe Protocol for ISS Crewmembers

3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	Preflight activities will include ISLE Training and exercise protocol verification.			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		ISLE Training and Exercise protocol verification: 45 min.	ISS EVA Prep and Post 31105	Can occur at either Prep and Post or at an NBL run	EPL personnel
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:		Test Location:	
	Laptop Computer, National Instruments USB-6212, Kurz Mass Flow Meter and Computer, AEI Technologies CO ₂ Analyzer, RPE Chart	LabView Software		JSC Building 9	
Testing Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:		Temperature Requirements:	Special Lighting:
	JSC/Building 9 Airlock Mockup or JSC/NBL Topside A or B	4 -110 Volt outlets		20-25 degrees C	N/A
	Hot or Cold Running Water:	Privacy Requirements:		Vibration/Acoustic Isolation:	Other:
	N/A	Controlled access		N/A	N/A
Constraints/Special Requirements:	N/A				
Launch Delay Requirements:	N/A				
Notes	N/A				
Data Delivery	<ul style="list-style-type: none">Whenever possible, data will be processed immediately after ISLE training and preliminary data will be reviewed with the crew at the end of the Prep & Post.ISLE training data will be included in the Metabolic Data binders delivered to the Flight Surgeon and BME before launch. MOD will receive a copy of the ISLE training with their metabolic data and upon request, Extravehicular Mobility Unit (EMU) Original Equipment Manufacturer (OEM) Systems Group leads and crewmembers will receive data. Non-attributable data may also be utilized in the EPL for reports, presentations and publications supporting the Human Health and Performance Directorate. Data will be archived in the EPL.				

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In-Flight Activities

TABLE 3.5.1: IN-FLIGHT ACTIVITIES

In-Flight Activity	Description:	This protocol is available for all crewmembers after ground training. Crewmembers will perform the in-suit light exercise as part of the nitrogen washout protocol prior to EVA. Additional on-orbit training/refresher on ISLE protocol may be uplinked to the crew.			
		Activity:	Duration:	Schedule:	Flexibility:
	Schedule:	ISLE Protocol	5:15	Before EVA	3 crewmembers (2 EVA, 1 Intravehicular)
Procedures:	ISLE EVA Prep, EMU Purge, ISLE EMU Prebreathe (with data collection), EMU Prebreathe, ISLE EVA Prebreathe Card. This is all located in the ISS EVA Systems Checklist.				
Constraints / Special Requirements:	Crewmembers must successfully complete ISLE training prior to launch.				
Photo / TV Requirements:	N/A				
Cold Stowage Requirements:	N/A				
Mission Extension Requirements:	N/A				
Data Delivery:	No data collection requirement				
Landing Wave-off Requirements:	N/A				

TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name
N/A

3.5 Postflight Activities : N/A

MR090L EVA In-Suit Light Exercise Prebreathe Protocol for ISS Crewmembers

3.6 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	BLOOD VOLUME	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training						
	8 hours (EPL personnel conduct a 15 minute overview, and 30 minutes of suited, light exercise with feedback and metabolic data collection)	ISS EVA Prep and Post 31105	Can occur at either Prep and Post or at an NBL run	N/A	MOD EVA Trainers/EPL Personnel	
Preflight Activities						
ISLE Training and Verification	EPL personnel conduct a 15 minute overview, and 30 minutes of suited, light exercise with feedback and metabolic data collection)	ISS EVA Prep and Post 31105	Can occur at either Prep and Post or at an NBL run	N/A	MOD EVA Trainers/EPL Personnel	
In-Flight						
EVA ISLE prebreathe	5:15	Before EVA		N/A	3 crewmembers (2 EVA, 1 Intravehicular)	
Postflight : N/A						
Postflight Debrief						
An EVA Debrief (Med Ops or EVA Office) will be scheduled where specific questions regarding the EVA In-Suit Light Exercise prebreathe will be addressed.						